

REMARKS

Claims 5-34 are pending. Claims 5, 6, 8-23 and 25-31 stand rejected, and claims 7 and 24 are objected to. By this Amendment, new claims 32-34 are added. Support for these claims can be found in the specification as filed and as explained in the arguments below and in the attached references. Thus, no new matter is added by these amendments.

REJECTION UNDER 35 U.S.C. §102(b) AND 103(a)

The Office Action rejects claims 5, 6, 8-23 and 25-31 under 35 U.S.C. §102(b) as anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 5,682,591 to Inculet et al. (Inculet). Applicants respectfully traverse this rejection.

The Office Action asserts that Inculet discloses a method of forming a compact and a die wall lubricant by selecting a metal powder; providing said metal powder, selected from a group containing Fe, to the die; providing a lubricant to the die wall; compacting said metal powder to form a green compact; and sintering said green compact to form a compact. Further, the Office Action asserts that Inculet discloses a charged lubricant and a lubricant selected from a group of lubricants claimed by Applicants including combinations of lubricants and including lubricants with melting points inherently within the claimed ranges. The Office Action thus argues that Inculet anticipates or would have rendered obvious the invention of claims 5, 6, 8-23 and 25-31. Applicants disagree.

Inculet fails to disclose, teach or suggest at least the instant claim limitations that the solid powder lubricants have melting points higher than the predetermined temperature of compaction pressure, which is the temperature at the surface of the die during the compaction pressure. Application, page 8, lines 23-24 and claims 5-6, 8-23 and 25-31. While the Office Action correctly states that Inculet discloses selecting the lubricant from a group of materials that is arguably broadly encompassed by the present claims, Inculet does not specifically teach selecting from within that group a lubricant (or lubricants) with a melting point above

the predetermined temperature of compaction pressure, as claimed. Inculet neither teaches or suggests this feature, nor any preference therefor. Thus, the claimed selection of lubricant is not anticipated by the teachings of Inculet. The teaching "to select combinations of lubricant 'as may be desired'" in Inculet is not enough to anticipate the present invention. Inculet does not teach the claimed invention.

Further Inculet would not have rendered the claimed invention obvious.

Inculet does not teach the advantages of using lubricants having melting points higher than the predetermined temperature of compaction pressure, which are provided by the invention of claims 5, 6, 8-23 and 25-31. Just as Inculet does not disclose, teach or suggest the specific limitations regarding the melting point, Inculet also does not disclose, teach or suggest the advantages provided thereby.

Furthermore, Inculet does not teach the use of solid powders over liquid lubricants. Implicit in Inculet is the teaching that solid powder lubricants, liquid lubricants and the combinations of such lubricants are all equally capable of providing the desired results. See Inculet, col. 3, line 66 - col. 4, line 19. Inculet states that "[d]ry lubricants typically function by melting due to the pressure and temperature employed during compaction, thereby allowing the melted lubricant to flow." Inculet, col. 1, lines 33-36. However, Applicants disclose that when a lubricant has a melting temperature below the predetermined temperature of compaction pressure, the lubricant may fuse. The fused lubricant may flow out of the surface of the die or may be suctioned into the iron-based powder by a capillary phenomenon. Both of these results decrease the amount of lubricant on the die surface and may increase ejection force. See Application, page 8, line 25 - page 9, line 7.

In contrast, Applicants unexpectedly discovered that "[b]ecause lubricant for die lubrication has a melting point higher than the predetermined temperature for compaction pressure, the lubricant is not fused." Application, page 8, lines 25-27. Rather than fusing on

the die surface and flowing or spreading in a liquid state, the lubricant for die lubrication of the claimed invention is present as a solid powder on the surface of the die. Inculet does not recognize these advantages or teach the importance of choosing a solid powder lubricant having melting temperature above the predetermined temperature of compaction pressure.

Further, Applicants discovered that by mixing two or more different lubricant powders, the lubricant powders adhere more reliably to the die surface, because the total electrical charge on the entirety of the powder is greater than when only one type of lubricant is used, due to contact electrification. Application, page 8, lines 11-24. Inculet does not disclose, teach or suggest the importance of the electric charge when at least two kinds of different materials (lubricant powders) are mixed and used. Inculet merely teaches that the materials may be used singularly as well as an admixtures of two or more lubricants. Inculet, col. 4, lines 15-17.

In addition, Inculet discloses a method in which the die is also electrified. Inculet, col. 3, lines 51-59, col. 7, lines 58-62, claim 1. However, electrifying the die requires special equipment and is so unusual that one of ordinary skill in the art would not consider such technique to be included unless clearly stated. See generally, W.G. BALL et al., "Replacing Internal with External Lubricants: Phase III Tribostatic Application of Lubricants onto Die Walls," Advances in Powder Metallurgy and Pariculate Sciences, MPIF, 2(1996), part 6, pp. 3-14, 1996 (copy enclosed); S. RASTOGI et al., "Die Wall Lubrication Studies at SFL," PM World Congress: Powder Compaction, pp. 171-176, 1998 (copy enclosed). Electrifying the die is unpopular and not commonly practiced, at least because the electrified die attracts objects by electrostatic attraction. When any object makes contact with the electrified die, the resultant spark may harm the facilities or personnel. Thus, protective barriers are necessary around the apparatus, at increased cost. Therefore, one of ordinary skill in the art

would not include or eliminate the step of electrifying the die from a reference without additional explicit instruction and/or additional motivation.

Still further, Inculet's Comparative Example 3 and Example 4 clearly show that unless the die is electrified, a lubricant does not uniformly deposit on the die. In contrast, the lubricant of the claimed invention adheres uniformly on the die without the additional step of electrifying the die.

Thus, the claimed selection of lubricant would not have been obvious in light of Inculet. Inculet does not teach, disclose or suggest the claimed invention. The Inculet "teaching to select combinations of lubricant 'as may be desired'" is not enough, in light of what is not disclosed -- the importance of using a mixture of at least two solid powder lubricants, each with melting points higher than the predetermined temperature of compaction pressure, and the effective charge on such mixture -- to have rendered the claimed invention obvious.

For at least the above reasons, claims 5, 6, 8-23 and 25-31 are not anticipated by and would not have been obvious over Inculet. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

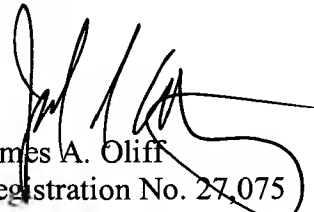
OBJECTION TO CLAIMS 7 AND 24

The Office Action objects to claims 7 and 24 as dependent on a rejected base claim. Applicants gratefully acknowledge the Office Action indication that these claims would be allowable if rewritten in independent form, including all the limitations of the base claim and any intervening claims. In light of the foregoing arguments regarding claims 5, 6, 8-23 and 25-31, Applicants submit that claims 7 and 24 no longer depend from claims that are not in condition for allowance, and that claims 17 and 24 are in condition for allowance. Accordingly, reconsideration and withdrawal of this objection is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 5-34 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,


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Attachments:

W.G. BALL et al., "Replacing Internal with External Lubricants: Phase III Tribostatic Application of Lubricants onto Die Walls," Advances in Powder Metallurgy and Pariculate Sciences, MPIF, 2(1996), part 6, pp. 3-14, 1996.

S. RASTOGI et al., "Die Wall Lubrication Studies at SFL," PM World Congress: Powder Compaction, pp. 171-176, 1998.

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